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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/929,503	08/15/2001	Tetsufumi Tsuzaki	50395-102	8232

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Washington, DC 20005-3096

EXAMINER
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CUNNINGHAM, STEPHEN C

ART UNIT	PAPER NUMBER
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3663

DATE MAILED: 04/13/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/929,503

Applicant(s)

TSUZAKI ET AL.

Examiner

Stephen C. Cunningham

Art Unit

3663

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 22 July 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-3 and 5-15 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 2, 3, 5 and 8 is/are allowed.
- 6) ☒ Claim(s) 1, 6, 7 and 9-15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 August 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION**

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

1. Claims 1, 6, 9, 12, and 13 are rejected under 35 U.S.C. 102(e) as being anticipated by Watanabe '984.

With respect to claim 1, Watanabe teach a gain module comprising:  
a first optical fiber having a composition in its optical region,  
a second optical fiber having another composition in its optical region, and  
one or more pump light sources which supply pump light for Raman amplification to each of the first and second optical fibers,  
wherein the first and second optical fibers are connected in series and having different wavelength ranges for amplification, and  
through the first and second optical fibers signal lights are amplified by stimulated Raman scattering.

See column 9, lines 54-67; column 22, lines 54-66; column 23, lines 1-59; column 24, lines 34-52; and figures 1, 2, 8, and 9. Watanabe

teaches transmission line comprised of a series of concatenated optical fiber sections having varying mode field diameters. Mode field diameter is dependent on fiber composition. The difference in stokes shift quantity is dependent on the compositions of the optical fibers. It is inherent that that for a single wavelength there will be at least two fiber sections with differing bands of amplification.

With respect to claim 4, Watanabe teaches that the fibers are connected in series, see figures 1 and 2.

With respect to claim 6, Watanabe teaches that the fibers are pumped by substantially the same wavelengths, see column 22, lines 55-66. Watanabe foresees loss compensation by distributed Raman amplification which entails pumping a transmission line to provide gain.

With respect to claim 9, Watanabe teaches an optical region of at least one of the optical fibers is doped with  $\text{GeO}_2$ . See column 24, lines 34-52.

With respect to claim 12, Watanabe teaches an optical communication system comprising optical transmission lines and one or more pump light sources; and

wherein the optical transmission lines comprise a plurality of optical fibers with optical regions of different compositions. See column 9, lines 54-67; column 22, lines 54-66; column 23, lines 1-59; column 24, lines 34-52; and figures 1, 2, 8, and 9. Watanabe teaches transmission line

comprised of a series of concatenated optical fiber sections having varying mode field diameters. Mode field diameter is dependent on fiber composition. The difference in stokes shift quantity is dependent on the compositions of the optical fibers. It is inherent that that for a single wavelength there will be at least two fiber sections with differing bands of amplification. It would have been obvious to one of ordinary skill in the art to modify the glass composition of the optical fibers in order to control the mode field diameter profile of the transmission line.

With respect to claim 13, Watanabe teaches a communication system comprising:

a plurality of optical fibers which differ from each other with respect to composition; and

one or more pump light sources which supply pump light for Raman amplification.

See column 9, lines 54-67; column 22, lines 54-66; column 23, lines 1-59; column 24, lines 34-52; and figures 1, 2, 8, and 9. Watanabe teaches transmission line comprised of a series of concatenated optical fiber sections having varying mode field diameters. Mode field diameter is dependent on fiber composition. The difference in stokes shift quantity is dependent on the compositions of the optical fibers. It is inherent that that for a single wavelength there will be at least two fiber sections with differing bands of amplification.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 7 and 10 rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe '984.

With respect to claim 7, Watanabe teaches that the light from one pump source is supplied to a plurality of fibers see column 22, lines 55-66. In distributed Raman amplification gain is distributed along the length of the transmission line. It would have been obvious to one of ordinary skill in the art at the time of invention by Applicant to pump the entire length of the transmission line in order to compensate for loss along the length of the transmission line.

With respect to claim 10, Official Notice is taken that  $P_2O_5$  is well known as a refractive index modifying agent. It would have been obvious to dope at least one of the first and second fibers with  $P_2O_5$  in order to control the mode field diameter of the optical fiber.

3. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe in view of Akasaka et al.

Regarding claim 11, Watanabe teaches a Raman amplifier comprising:

a plurality of optical fibers which differ from each other with respect to composition; and

one or more pump light sources which supply pump light for Raman amplification.

See column 9, lines 54-67; column 22, lines 54-66; column 23, lines 1-59; column 24, lines 34-52; and figures 1, 2, 8, and 9. Watanabe teaches transmission line comprised of a series of concatenated optical fiber sections having varying mode field diameters. Mode field diameter is dependent on fiber composition. The difference in stokes shift quantity is dependent on the compositions of the optical fibers. It is inherent that that for a single wavelength there will be at least two fiber sections with differing bands of amplification.

Akasaka et al teaches a Raman fiber amplifier comprising a control unit. It would have been obvious to modify the apparatus of Watanabe by adding the control apparatus of Akasaka et al. in order to allow the amplifier to compensate for dynamic input characteristics.

4. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe in view of Mollenauer et al. '452.

Regarding claim 14, Watanabe fails to teach a first and second multiplexer introducing pump light into the first optical fiber at the connection point to the second optical fiber and introducing pump light into the second optical fiber at the other end of the second fiber. Mollenauer teaches a series of optical fibers wherein a first pump light is input into a first fiber section through a coupler located between the first and the second fiber; and a second pump light is input into a second fiber section through a coupler located between at the other end of the second fiber. see figures 3 and 4. It would have been obvious to modify the apparatus of the Watanabe by providing counter propagating pump light at the end of each fiber section in order to reduce ASE.

Regarding claim 15, it would have been obvious to modify the apparatus of Watanabe by utilizing separate pump sources to pump each fiber section in order to increase gain.

### ***Allowable Subject Matter***

Claims 5 and 8 are allowed. See reasons for allowance in paper 9.

Claim 2 and 3 are allowed. See reasons for indication allowable subject matter in paper 12.

### ***Response to Arguments***



Applicant's arguments filed 12-30-04 have been fully considered but they are not persuasive.

Regarding claims 1, 12, and 13, Applicant argues: "Watanabe, however, does not disclose or suggest a series of concatenated optical fiber sections having different composition, as required by independent claims 1, 12, and 13. Moreover, even if two fiber have different composition, there is no teaching or basis to conclude that Raman amplification in two different wavelength bands must exist."

Examiner disagrees with this argument. The simplest description of the Watanabe invention (column 3, lines 34-39) states

The total dispersion (product of an average value of the chromatic dispersion and the length) of the first optical fiber substantially coincides with the total dispersion of the first portion, and the total dispersion of the second portion substantially coincides with the total dispersion of the third optical fiber.

This dispersion compensation is in part determined by the mode field diameter (discussed in column 24, lines 34-53 of Watanabe). The mode field diameter is influenced by the fiber composition and in the case of the Watanabe invention  $\text{GeO}_2$  concentration. The basis to conclude that Raman amplification in two different wavelength bands must exist is based on the nature of the Raman effect. Raman effect, defined in the Photonics Dictionary states "A small part of the scattered light has frequencies removed from the frequency of the incident beam by quantities equal to vibration frequencies of the material scattering system." Differing materials have inherently different vibration frequencies and therefore have different amplification bands. Two fiber sections with dispersion values independently determined results in independently determined fiber compositions and therefor independently determined

gain band. This is not intended to suggest that there is a great difference in the gain bands but such a limitation is not claimed.

***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen C. Cunningham whose telephone number is 703-605-4275. The examiner can normally be reached on Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas G. Black can be reached on 703-305-8233. The fax phone numbers for the organization where this application or proceeding is assigned are (703)

Application/Control Number: 09/929,503

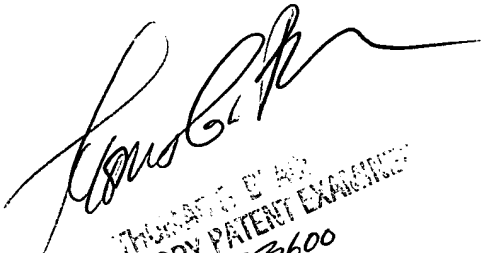
Page 10

Art Unit: 3663

872-9306 for regular communications and (703) 872-9306 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-1113.

SCC  
April 4, 2004

  
THOMAS G. B. A. B.  
SUPERVISORY PATENT EXAMINER  
GROUP 3600